

CLAIMS

What is claimed is:

- 1 1. A method for the separation of the components of a mixed sample solution of single
2 stranded nucleic acids and their complementary strands, and for detecting therein a
3 selected target sequence, said method comprising the steps of:
 - 4 a. mixing the sample with a PNA probe having a sequence complementary to at
5 least a portion of said target sequence thereby to form a detectable PNA/nucleic
6 acid duplex; and, thereafter
 - 7 b. separating the species in the sample; and
 - 8 c. detecting said detectable duplex.
- 1 2. The method of claim 1 wherein the PNA probe is labeled with a detectable moiety.
- 1 3. The method of claim 2 wherein the detectable moiety is selected from the group
2 consisting of enzymes, colored particles, fluorophores, biotin, chromophores,
3 radioisotopes, electrochemical and chemiluminescent moieties.
- 1 4. The method of claim 6 wherein the species are separated in a sieving medium.
- 1 5. The method of claim 4 wherein the sieving medium is selected from the group consisting
2 of polyacrylamide, agarose, polyethylene oxide, polyvinyl pyrrolidine and
3 methylcellulose.
- 1 6. The method of claim 1 wherein the species are separated electrophoretically.
- 1 7. The method of claim 6 wherein the species are separated by capillary electrophoresis.
- 1 8. The method of claim 1 wherein step (b) is performed under conditions suitable to
2 denature nucleic acid/nucleic acid hybrids.
- 1 9. The method of claim 1 wherein the nucleic acid sample comprises strands of greater than
2 50 nucleotides in length.

- 1 10. The method of claim 1 wherein step b) occurs in a denaturing medium.
- 1 11. The method of claim 10 wherein the denaturing medium reagent comprises a selected
2 from the group consisting of urea, formamide, and organic solvents.
- 1 12. The method of claim 10 wherein the temperature of the medium is adjusted to render the
2 medium denaturing.
- 1 13. A method for the separation of the components of a mixed sample solution of single
2 stranded nucleic acids, and for detecting therein a selected target sequence, said method
3 comprising the steps of:
 - 4 a. mixing the sample with a PNA probe having a sequence complementary to at
5 least a portion of said target sequence, if present, thereby to form a detectable
6 PNA/nucleic acid duplex;
 - 7 b. after step a) separating the components in the sample;
 - 8 c. detecting said duplex.
- 1 14. The method of claim 13 wherein step b) is performed in a denaturing medium.
- 1 15. The method of claim 15 wherein the denaturing medium is a sieving medium.
- 1 16. The method of claim 14 wherein the PNA probe is labeled.
- 1 17. The method of claim 16 wherein the sieving medium is selected from the group
2 consisting of polyacrylamide, agarose, polyethylene oxide, polyvinyl pyrrolidine and
3 methylcellulose.
- 1 18. The method of claim 17 wherein the label is selected from the group consisting of
2 enzymes, fluorophores, biotin, chromophores, radioisotopes, colored particles,
3 electrochemical and chemiluminescent moieties.
- 1 19. The method of claim 14 wherein the species are separated electrophoretically.
- 1 20. The method of claim 19 wherein the species are separated by capillary electrophoresis.

- 1 21. The method of claim 14 wherein the denaturing medium comprises a denaturing reagent.
- 1 22. The method of claim 14 wherein the medium is rendered denaturing by adjusting the
2 temperature of the medium.
- 1 23. An apparatus for the detection in a sample of a polynucleic acid comprising a selected
2 target sequence, said apparatus comprising:
- 3 a. a sample injection zone;
- 4 b. a PNA probe, disposed to mix with a sample introduced to said injection zone,
5 having a sequence complementary to said selected target sequence, and which
6 hybridizes with said target sequence, if present, to form a detectable complex;
7 and
- 8 c. a separation zone in communication with said injection zone.
- 1 24. The apparatus of claim 23 wherein the separation zone comprises a sieving medium.
- 1 25. A kit for the separation of the components of a mixed sample solution of single stranded
2 nucleic acids and their complementary strands, and for detecting therein a selected target
3 sequence, comprising
- 4 a. a detectable PNA probe having a sequence complementary to at least a portion
5 of said target sequence in an electrophoretic medium, and:
- 6 b. a denaturing sieving medium.
- 1 26. The kit of claim 25 wherein the electrophoretic medium is disposed in a capillary or
2 channel.
- 1 27. The kit of claim 26 comprising at least two PNA probes, each having a sequence
2 complementary to a different said target sequence.
- 1 28. The apparatus of claim 23 further comprising a means for controlling the temperature.
- 1 29. The apparatus of claim 23 comprising a sample incubation means disposed in association
2 with the sample injection means.
- 1 30. The apparatus of claim 23 wherein the separation zone is a capillary channel.

- 1 31. A microchip apparatus comprising up to 100 capillary channel, each further comprising:
 - 2 a. a sample injection zone;
 - 3 b. a detection zone
 - 4 c. a separation zone in communication with and connecting said injection zone
 - 5 with said detection zone.

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